Survey of Pink Salmon in Eastern Lake Superior, 1981

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SURVEY OF PINK SALMON IN EASTERN LAKE SUPERIOR, 1981

by

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ABSTRACT

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In 1981 a survey of pink salmon in eastern Lake Superior, by fishing in open lake waters, in bays and monitoring spawners, was carried out to assess their commercial and recreational potential. Between July 29 and August 26, 292 pinks, 85 chinooks and 61 coho were caught in open lake waters in 80,600 m of gillnet sets and 27.5 h of trolling. Pacific salmon were 23% of the total catch. All gillnetted salmon were caught in off-bottom nets. Both gillnets and trolls appeared to select male pinks. Average size of gillnet-caught pinks was 0.59 kg; troll-caught pinks averaged 0.52 kg. All were maturing at age 1+. Pinks continued to grow during the survey. They fed mainly on mysids, smelts and terrestrial insects during August; later, close to spawning streams, they fed on smelts. Pink catches in gillnets improved in late August when fishing was concentrated near spawning streams, but never exceeded 20 per 1000 m of net in one set. Overall, trolled lures took 1.05 fish per rod/h; pinks and chinooks made up 2/3 of the troll catch. The remainder was mostly lake trout. Consumers' reaction to pinks showed them to be desirable for home cooking.

Of 75 chinooks sampled, 4 were maturing and 71 were immature. Average weight of immatures was 0.74 kg; that of maturing fish was 1.8 kg. Of 51 coho sampled, 48 were maturing and 3 were immature. Maturing coho averaged 1.1 kg. Further trials in areas and times of known salmon concentration are recommended.

Key words: pink salmon, coho salmon, chinook salmon, Lake Superior, transplant, sex ratio, size, growth, food habits, flesh quality, commercial potential, sport fishing

RESUME

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En 1981, un relevé du saumon rose a été effectué dans la partie est du lac Supérieur afin d'en évaluer les possibilités commerciales et sportives. On a procédé par pêche dans les eaux du lac même et des baies et par contrôle des reproducteurs. Du 29 juillet au 26 août, 292 saumons roses, 85 saumons quinnats et 61 saumons cohos ont été capturés dans les eaux du lac à l'aide de 80 600 mètres de filets maillants et en pratiquant 27,5 heures de pêche à la traîne. Les saumons du Pacifique representaient 23 % des prises totales. Tous les saumons capturés au filet maillant l'ont été dans des filets placés au-dessus de fond. La pêche au filet maillant et la pêche à la traîne ont semblé être sélectives pour les mâles des saumons roses. Le poids moyen des saumons roses capturés au filet maillant était de 0,59 kg et celui de ceux capturés à la cuiller de 0,52 kg. Ils parvenaient tous à maturité à l'âge de 1+. Les saumons roses ont continué à croître pendant le relevé. En août, ils se nourrissaient surtout de mysidés, d'éperlans et d'insectes terrestres; plus tard et près des cours d'eau de frai, ils se nourrissaient d'eperlans. Les prises de saumons roses au filet maillant se sont accrues vers la fin d'août, quand la pêche a été concentrée près des cours d'eau des frayères, mais elle n'a jamais dépassé 20 individus par 1 000 mètres de filet en un seul jeu. Au total, la pêche à la cuiller a donné 1,05 poisson par canne et par heure; les saumons roses et quinnats formaient les 2/3 des prises, le reste étant surtout représenté par des touladis. Les réactions des consommateurs indiquaient un intérêt pour la consommation domestique du sumon rose.

Des 75 saumons quinnats échantillonnés, quatre étaient en voie de maturation et 71 étaient immatures. Le poids moyen des immatures était de 0,74 kg it celui des poissons en maturation de 1,8 kg. Des 51 saumons cohos échantillonnés, 48 étaient en voie de maturation et 3 étaient immatures; le poids moyen des premiers était de 1,1 kg. Nous recommandons d'effectuer d'autres essais dans les zones et les périodes connues de concentration des saumons

Mots-clés: saumon rose, saumon coho, saumon quinnat, lac Supérieur, transplant, rapport des sexes, taille, croissance, comportement, alimentaire, qualité de la chair, possibilités commerciales, pêche sportive

INTRODUCTION

As part of an attempt to establish pink (Oncorhyncus gorbuscha) and chum (O. keta) salmon in streams tributary to Hudson Bay (Ricker and Loftus 1968), in 1955 787,000 pink salmon eggs were collected from spawners in the Lakelse River, a tributary to the Skeena River near Terrace, British Columbia. The eggs were incubated to the eyed stage at the Horsefly Lake Hatchery (in the Fraser River watershed), then shipped to the Port Arthur Hatchery where they were incubated further. In early 1956 some 737,000 eyed eggs, sac fry and fingerlings were flown north and planted in Goose Creek, tributary to Hudson Bay. As with the chum transplant of a year earlier, no pink salmon returned later to Goose Creek as spawning adults, and both transplants were considered to have failed (Nunan 1967).

After the final shipment from Port Arthur to Goose Creek, 3 troughs of about 7000 fingerlings each remained at the Port Arthur Hatchery. These were discarded into a sewer which emptied into the nearby Current River. Three years later (1959) 2 pink salmon were caught by anglers near the mouths of two Minnesota streams flowing into Lake Superior. Their scales showed them to be 2-year-olds which must have arisen from an undetected 1957 spawning. Subsequent reports showed that the pinks were spreading further into Minnesota streams and into the Lake Superior waters of the Province of Ontario (Schumacher and Hale 1962), so that Kwain (1978) was able to state that "By 1975 the tenth generation of pink salmon was found in almost every tributary of Lake Superior in Ontario waters."

The spread was not confined to Lake Superior. In 1969 adults were reported in Lake Huron, and in 1973 in Lake Michigan. By 1979 they had descended into Lakes Erie and Ontario, although it has not yet been determined whether or not they have become established in the two lower Great Lakes (Kwain and Lawrie 1981). Neither is it clear whether 2 pink salmon recovered in Quebec (one in the Natassquan River on the north side of the Gulf of St. Lawrence in 1967 [G. Roy personal communication]) arose from the Lake Superior stock or from earlier transplants to Newfoundland (Lear 1975).

Some pinks in Lake Superior have overcome their natural tendency to mature at age 2 years, and have matured at age 3. Kwain and Chappell (1978) report finding spawning pinks in the Steel River, flowing into northern Lake Superior, in 1956. Although the spawners were age 2 fish they undoubtedly arose from a few individuals which matured one year later than normal. Hence it now appears that an even-year line may become established, although currently it is much less abundant than the odd-year one.

During the spring and early summer of 1981, discussions between the staffs of Canada Department of Fisheries and Oceans and the Ontario Ministry of Natural Resources led to agreement that the potential for exploitation of Lake Superior pink salmon should be investigated. As a result a joint undertaking in a fishing survey was agreed to and carried out, involving staff and resources of both agencies. It was agreed that the survey should investigate the feasibility of commercial harvesting of Lake Superior pink salmon with gillnets, and explore the potential for greater utilization of pinks by sport fishermen.

The purpose of this report is to describe the findings of the survey.

METHODS

The area covered by the survey extended along the northeast shore of Lake Superior from Gros Cap (near Sault Ste. Marie) to Santoy Bay (near Terrace Bay). The survey consisted of 2 cruises: July 29 to August 14 and August 17 to 28. The first cruise extended from Mamainse Harbour to Maple Island to Michipicoten Bay and Island to Santoy Bay and return to Mamainse Harbour. The second extended from Gros Cap to Michipicoten Bay and Island and Isacor Point and return to Mamainse Harbour (Fig. 1). For identification of the locations mentioned here and in Appendix Table 1, the reader should refer to the hydrographic chart for Lake Superior, i.e., Canadian Hydrographic Service Chart No. 10032. For closer identification of gillnet set locations the following CHS charts would be useful:

19022: St. Marys River to Au Sable Point
10035: Coppermine Point to Cape Gargantua
10036: Cape Gargantua to Otter Head
10019: Michipicoten Island to Oiseau Bay
10034: Jackfish Bay to St. Ignace Island
10020: Caribou Island to Michipicoten Island

The gillnet vessel employed in the survey was an 80 ft (24 m) Great Lakes fishing tug powered with a 340 hp diesel engine. It was equipped with automatic steering, depth recorders, loran, VHF radio, radar, hydraulic net lifter and hydraulic crane. The tug carried a 17 ft (5 m) Boston Whaler powered by an 80 hp outboard engine and equipped with a small recording depth sounder.

Fishing was carried out mainly by setting gillnets at the surface or down to 4 fath (7.3 m) at 1 fath (1.8 m) intervals by "canning" the nets. Canning involved suspending the nets from surface buoys made of bundles of cork floats ("beetles") with lines adjusted to the desired depths. Large metal buoys ("cans") were placed at the beginning and end of a series of nets set at a particular depth. The gangs of nets were anchored at both ends to prevent drifting, and marked with a buoy bearing a flag. Occasionally a gang of nets, or portions of a gang, were set on the lake bottom to compare near-surface catches with those from deeper water. Most often the nets were set perpendicular to the shoreline, but occasionally they were set at an angle or parallel to it. The gangs of nets were shot from the stern of the tug and lifted with an hydraulic net lifter located on the port side about one-third of the way back from the bow.

The bulk of gillnetting was carried out with 3 kinds of net: 3-1/4 in (8.25 cm) stretched measure multifilament nylon 60 meshes deep; 2-3/4 in (7.0 cm) stretched measure multifilament nylon 60 meshes deep, and

3-1/8 in (7.9 cm) stretched measure monofilament nylon 60 meshes deep. Each net was 50 m long, fitted with cork- and lead-lines in such a way as to sink the net to the bottom unless it was supported by canning. "Bullnets" consisting of 2 panels of web sewn together along a long side of each (to double the depth of the net) were tried early but subsequently put aside when they were found awkward to set and lift. A gang of 4-1/2 in (11.4 cm) stretched measure multifilament 60 mesh nets was used infrequently.

Several gangs of nets were set each afternoon or evening. They were lifted the next morning (except for one occasion when they were left set for 2 nights). The dates, times of setting and lifting, and locations of sets are given in Appendix Table 1.

Fishing by trolling was carried out when time permitted between travelling and setting and lifting gillnets. Two sport trolling rods were used, held in rod holders on either side of the Boston Whaler. Lures consisted of "hoochies", 2 in (5 cm) long plastic imitations of squids set on 2 single barbed hooks attached to the leader in tandem. Usually the hoochie was red or green in colour, but white and blue ones were also used. The lure and hooks were attached to a 12 in (30 cm) flasher by an 18 in (46 cm) leader of 10 lb (4.5 kg) test nylon. An 8 oz (227 g) removable lead weight was attached to the 20 lb (9 kg) test nylon main line about 20 ft (6 m) ahead of the flasher. The lures were trolled at a speed of 3-4 km/hr, sufficient to cause the flasher to rotate and to cause the lure to move forward with a circular motion.

The dates and times of trolling are given in Table 3.

Lengths of pinks caught in the gillnets and by trolling were recorded as fork (tip of snout to fork of tail) and hypural (posterior margin of orbit to anterior edge of hypural plate) lengths to the nearest mm. They were weighed on a hanging spring scale to the nearest 0.1 kg. Their sex and state of maturity were noted. Coho and chinook were examined similarly except that their hypural lengths were not recorded. Catches of other species were sampled on occasion, except for lake trout which were all measured and weighed and examined for missing fins and lamprey marks.

Temperatures of the upper water column were recorded from an electronic thermometer at 5 m intervals up to the surface while the sensor was being retrieved from the full extent of the cable (30 m), or from the lake bottom if less than 30 m. Usually they were taken at the end of a gillnet set, at the deeper end of each setting location. No water temperatures were recorded during trolling activities, which covered wider areas than single gillnet locations. Figures shown in Appendix Table 1 are the means of temperatures recorded at 0, 5 and 10 m depths, intended to represent average temperature conditions in the near-surface water in which the nets usually were set.

At each gillnet set location, weather information was recorded as wind direction and velocity, air temperature and proportion of sky covered by cloud. No weather information was recorded in association with trolling.

To observe food habits, the stomachs of individual pink salmon were first examined in the field to determine whether or not they contained food

items. Those containing food were preserved in 10% formalin for later examination in the laboratory, where food organisms were sorted and identified. The number of stomachs in which each item occurred was recorded and expressed as a percentage of the total number of stomachs examined. Total volume of contents per individual containing food was recorded.

To assess the public's opinion of the eating quality of pink salmon, 100 evaluation sheets were distributed to sport fishermen and friends of OMNR staff. The sheet queried consumers on how they rated pink salmon flesh as a food. They were asked to rate its freshness, appearance, texture, taste and ease of preparation on a scale of poor/fair/good/very good. They were asked how the fish had been prepared (whole, steaked, filleted or other) and the method of cooking (fried, baked, boiled, steamed, broiled or other). Other comments were invited. Return of the sheets was voluntary.

RESULTS

CATCHES OF ALL FISH IN GILLNETS

During the survey 78 gillnet sets were made involving a total length of 80,600 m of gillnet fished. Most of the nets were set at the surface or down to 4 fath (7.3 m); only a few were set on the lake bottom. The total catch of all species is shown in Table 1.

Eighteen species were represented in the catch, of which 8 species comprised 98.5% (smelts and alewives excluded). The bulk of the catch was either coregonines (43.7% -- lake herring, lake whitefish, round whitefish, chub and tullibee) or salmonines (36.3% -- pink salmon, lake trout, chinook salmon, coho salmon, rainbow and brown trout). Among the whitefishes, lake herring outnumbered all others. Largest catches of herring were produced sometimes from bottom sets (e.g., set no. 20, 39) and sometimes from near-surface sets (e.g., set no. 14, 31, 34) (Appendix Table 1). Among the salmons and trouts, pink salmon and lake trout were most abundant in the catches. Pacific salmon (pink, chinook and coho) comprised 22.2% of the catch. Largest catches of lake trout came from bottom sets, e.g., set no. 20, 39, 52, while near-surface sets produced a few in many sets (Appendix Table 1). No salmon were caught in bottom sets.

CATCHES OF PINKS IN GILLNETS

All of the pinks caught were maturing fish, i.e., they would have spawned in 1981, and all were age 1+ (2-year-olds).

Only 23 pinks were caught in the 42 sets of the first cruise (July 29 to August 14). These were taken in small numbers over a wide area from Alona Bay in the south to Santoy Bay in the north. The remainder (243) were

Table 1. Total catch of fish by species in 78 overnight gillnet sets involving 80,600 m of net, between Gros Cap and Santoy Bay, July 29 to August 28, 1981, and catch per 1000 m.

Species	Catch	%	Catch per 1000 m
Lake herring (Coregonus artedi)	512	28.2	6.4
Sucker (Catostomus commersoni)	349	19.2	4.3
Pink salmon (Oncorhynchus gorbuscha)	266	14.7	3.3
Lake trout (Salvelinus namaycush)	247	13.6	3.1
Lake whitefish (Coregonus clupeaformis)	239	13.2	3.0
Chinook salmon (Oncorhyncus tsawytscha)	84	4.6	1.0
Coho salmon (Oncorhynchus kisutch)	52	2.9	0.6
Round whitefish (Prosopium cylindraceum)	38	2.1	0.5
Burbot (Lota lota)	9	0.5	0.1
Rainbow trout (Salmo gairdneri)	7	0.4	0.1
Chub (Coregonus spp.)	4	0.2	0.05
Brown trout (Salmo trutta)	2	0.1	0.03
Perch (Perca flavescens)	2	0.1	0.03
Pickerel (Stizostedion vitreum)	2	0.1	0.03
Sturgeon (Acipenser fulvescens)	1	0.05	0.01
Tullibee (Coregonus spp.)	1	0.05	0.01
Rainbow smelt (Osmerus mordax)	+		+
Alewife (Alosa pseudoharengus)	+		+
Total	1815+	100.0	22.5+

taken in the 36 sets of the second cruise (August 17 to 28) from Gros Cap to the vicinity of Isacor Point (the second cruise did not extend as far as Santoy Bay). Most were caught in areas close to Michipicoten Island and Bay, Isacor and Grindstone Points, and Agawa Bay. The following table shows catches per unit effort of the two cruises, from all sets whether on bottom or canned (from Appendix Table 1):

Cruise	Catch	Length of net set (m)	Catch per 1000 m
1	23	44,000	0.52
2	243	36,600	6.64
Both	266	80,600	3.30

While some of the difference in catch per unit effort between the two cruises undoubtedly arose from improved fishing technique by the time of the second cruise, and from having identified the more likely fishing locations, catches from many of the sites fished in the first cruise were markedly better when the sites were refished during the second. We conclude that the larger catches of the second reflect a denser congregation of pinks in the shoreward areas as the season progressed, particularly in the vicinities of spawning streams, e.g., Michipicoten, Old Woman and Agawa Rivers. We must conclude that, with the methods employed in this survey, gillnet fishing for pinks prior to mid-August would not be warranted.

Catches during the second cruise suggest that a limited gillnet operation may be warranted after the pinks have congregated in certain areas. Table 2 shows the catch per unit effort from all sets, or portions of sets, made in near-surface waters in 5 localities during the period August 20-27. The catches suggest that 4 areas should be tested further through a directed fishery to determine the best fishing sites within them: the north side of Michipicoten Island, Michipicoten Bay, Grindstone and Ryan Points and Agawa Bay. We cannot comment on likely catches in Santoy Bay (at the mouth of the Steel River, which supports a substantial spawning run) in late August because that area was not fished during the second cruise.

The fishing pattern was not arranged to compare directly the catching ability of different mesh sizes and types used in the survey, nor the differences in catch between nets set at the surface and at intervals down to 4 fath (7.3 m). The following table shows the overall catches of pinks per 1000 m of 4 different meshes employed in all sets made at any depth down to 4 fath (from Appendix Table 1):

Table 2. Dates of setting, set numbers, total length of net set, total catches of pink salmon, and catches per 1000 m of gillnet for off-bottom sets made in 5 localities during the period August 17-28, 1981 (from Appendix Table 1).

	Dates	Set no.	Length of net set (m)	Catch	Catch per 1000 m
Isacor Pt.	Aug 24	63,64 65,66 67	3,800	25	6.6
N. side Michipicoten I.	Aug 23	58,59 60	2,500	42	16.8
Michipicoten Bay	Aug 20	52	1,000	14	14.0
Grindstone, Ryan Pt.	Aug 21 22,25	53,54 55,56 56,68 69,70	10,300	100	9.7
Agawa Bay	Aug 27	76,77 78	2,500	48	19.2
Totals			20,100	229	11.4

Mesh	Catch	Length of mesh set (m)	Catch per 1000 m
2-3/4 in multifilament	20	13,900	1.4
3-1/8 in monofilament	67	13,900	4.8
3-1/4 in multifilament	177	46,000	3.8
4-1/4 in multifilament	2	2,000	1.0
Total	266	75,800	3.5

Catches of pinks in nets at 0, 1 or 2 fath appeared to be greater than those set at 3 or 4 fath. Hence as the season progressed fishing tended to be directed to net depths of 0 to 2 fath.

CATCHES OF ALL FISH BY TROLLING

Trolling was carried out as time permitted between setting and lifting gillnets and travelling. As a result most trolling effort took place in afternoons and evenings (Table 3). The method used was based on that employed by B.C. anglers fishing for pinks in coastal marine waters, except that the flashers and lures were reduced in size to accommodate the smaller size of Lake Superior pinks (see METHODS).

The catch of 57 fish consisted entirely of salmonines. Pinks made up 46% of the catch, lake trout 35% and chinooks 16%. The average weight of trolled pinks was 1.1 lb (0.52 kg). The average weight of chinooks was about 2.5 lb (1.1 kg), although most were about 1 lb (0.5 kg) while one weighted 9 lb (4.1 kg). Trolled lake trout weighed 2 to 4 lb (0.9 to 1.8 kg).

As was the case with gillnetting, more pinks were caught by trolling later in the season (August 20-26) and close to spawning streams, e.g., Michipicoten and Old Woman Rivers (Table 3). The catches per rod hour suggest that these techniques could be employed by anglers in selected areas during August to provide satisfactory catches of pinks and chinooks without foregoing the opportunity of catching lake trout as well.

SEX RATIO, SIZE AND GROWTH OF PINKS

Of the entire catch of pinks in gillnets, the sex of 4 was not recorded. Among the remaining 262 fish, 212 were males and 50 were females (5.2:1). Among the 26 troll-caught pinks, of which the sex was recorded for 21, the ratio was 16 males to 5 females ($\chi^2 = 3.84$, $p<.05$). Thus significantly more males than females were caught with both types of gear. For gillnet-caught pinks it can be argued that development in males of a hooked jaw and stronger teeth, characteristic of approaching maturity, makes

Table 3. Dates, times and catches of fish by species taken by trolling at various locations, July 29 to August 26, 1981.

Trip no.	Date	Start time	Hours	Location	Pinks	Lake trout	Chinook	Coho	Rainbow trout	Total
1	July 29	1040	1.5	2 mi W of Pancake R			1			1
2	30	1130	1.9	Pancake Bay	1		1			2
3	Aug 4	1600	3.0	Michipicoten Bay	1		1			2
4	5	1320	3.3	Isacor Point		1	3		1	5
5	5	1800	1.5	Michipicoten Bay		2	1			3
6	6	2100	1.0	Jackfish Bay						
7	8	1200	1.7	Santoy Bay						
8	8	1700	1.0	Slate Islands		1				1
9	17	1230	2.0	N. of Mamainse Hbr	1					1
10	20	1730	2.0	Michipicoten Bay	2	3	1			6
11	21	1130	1.0	Michipicoten Bay	3	3				6
12	21	1715	2.9	Grindstone Point	2	4	1			7
13	22	1300	1.0	McKinnon Shoal to Old Woman Bay	4	4				8
14	25	1345	1.5	Grindstone Point	1	1		1		3
15	25	1815	1.2	Old Woman Bay	10	1				11
16	26	1815	1.0	Caribou Island	1					1
Total			27.5		26	20	9	1	1	57
Catch per hour					0.9	0.7	0.3	0.04	0.04	2.1
Catch per rod per hour					0.45	0.35	0.15	0.02	0.02	1.05

them more likely than females to tangle in gillnet web. But these changes seem unlikely to bring about greater susceptibility of males to hook and line fishing.

Pink salmon spawning runs to 2 streams entering southeastern Lake Superior were monitored during and after the lake survey. Daily sex ratios varied significantly during the course of the runs. In Pancake River, the ratio of males to females entering the river up to September 12 ranged from 11.1:1 to 2.7:1, while after that date the ratios ranged from 2.7:1 to 0.5:1. In Carp River, sex ratios ranged from 9.5:1 to 2.7:1 prior to September 12, then from 3.6:1 to 0.9:1 thereafter. At upstream nets, sex ratios were similar to those observed at river mouth nets, with females making up a larger proportion of the catch from the middle to the end of the spawning run. Overall estimates of males and females present suggested a sex ratio not significantly different from 1:1 in both rivers. These observations suggest that the sex ratio of pinks while still in Lake Superior is likely 1:1. We must conclude that males predominate in gillnet and troll catches because of differences between the sexes in behaviour or body shape, and not because of an unbalanced sex ratio among pinks while in the lake.

Figures 2, 3, 4 show the distribution of lengths and weights of gillnet-caught males and females. Range in size was greatest in males. Hypural length data, i.e., measurements from the posterior edge of the orbit to the anterior edge of the hypural plate, have been shown (Fig. 3) to eliminate distortion in length caused by elongation of the jaws and lateral compression of the body in maturing males. Differences in body shape between males and females were examined by covariance analysis of slopes and heights of regression lines of weight on hypural length, and fork length on hypural length. The fork length of males for a given hypural length was greater than that of females ($p = 0.03$); the weight of males was greater than that of females for a given hypural length ($p = 0.02$) Thus, for a given trunk length, males were heavier and longer than females, reflecting the more pronounced change in shape in males as they mature.

Length and weight characteristics of gillnet and troll catches are given in Table 4. Average weight of all gillnet-caught pinks was 0.59 kg (1.3 kg). On average males weighed 0.60 kg (1.3 lb) while females weighed 0.55 kg (1.2 lb), a significant difference. Although males were slightly longer than females on average, the difference was non-significant.

Troll-caught pinks were significantly shorter and lighter than those caught in gillnets. Both males and females weighed 0.52 kg (1.1 lb) on average and their lengths were not significantly different.

To determine whether or not pinks were growing during the period of the survey, we compared the lengths and weights of those caught in Cruise 1 (July 29 to August 14) with those caught in Cruise 2 (August 17 to 28) (Table 5). Those taken in Cruise 2 were significantly longer and heavier: on average those from Cruise 2 were 1.3 cm (0.5 in) longer in fork length and 90 g (3.2 oz) heavier.

During the survey of spawning runs of Pancake and Carp Rivers (see above), pink salmon were weighed to compare their size with those of previous odd-year spawning runs (Kwain and Lawrie 1981). The average weight overall in

Table 4. Lengths, weights and standard deviations of gillnet- and troll-caught pink salmon, July 29 to August 28, 1981. Comparisons are based on "t" tests.

	Fork length (mm)	Hypural length (mm)	Weight (kg)
Gillnet-caught			
All	363 ± 29	301 ± 22	0.59 ± 0.17
n	263	263	263
Males	364 ± 30	301 ± 23	0.60 ± 0.17
n	211	211	211
Females	358 ± 22	299 ± 18	0.55 ± 0.13
n	50	50	50
p (♂♂ vs ♀♀)	0.17	0.40	0.04*
Troll-caught			
All	350 ± 23	292 ± 19	0.52 ± 0.12
n	21	21	20
Males	348 ± 23	290 ± 19	0.52 ± 0.09
n	16	16	15
Females	353 ± 24	296 ± 20	0.52 ± 0.18
n	5	5	5
p (♂♂ vs ♀♀)	0.69	0.56	1.0
All gillnet-caught vs all troll-caught:			
p	0.02*	0.04*	0.02*

Table 5. Comparison of lengths and weights of pink salmon caught in Cruises 1 and 2, July 29 to August 28, 1981. Based on "t" tests.

	Fork length (mm)	Hypural length (mm)	Weight (kg)
Cruise 1	352 ± 25	291 ± 20	0.51 ± 0.12
n	17	17	17
Cruise 2	365 ± 30	302 ± 23	0.60 ± 0.17
n	194	194	194
Cruise 1 vs Cruise 2:			
p	0.05*	0.05*	0.01*

Table 6. Weights and lengths of pink salmon taken from two tributaries of Lake Superior during the 1981 spawning run.

			Weight (g)			Fork length (mm)		
		n	$\bar{x}$	SE	Range	$\bar{x}$	SE	Range
Carp	♂	50	750	30	420-1650	391	5	341-528
	♀	20	690	20	460-950	387	3	362-415
Pancake	♂	110	719	19	320-2270	389	3	325-575
	♀	30	710	30	390-1050	390	5	330-428

1981 was 717 g (1.7 lb), greater than that observed in the 5 previous odd-year runs except 1977 (Table 6). It should be noted also that several males in the 1981 run to Pancake River weighed 2.3 kg (5.1 lb), larger than any observed before in Lake Superior tributaries. These observations suggest that the maturing pinks continued to grow during the period between the end of the lake survey (August 28) until they were observed on the spawning grounds (mid-September).

FOOD HABITS OF PINKS

A total of 461 pink salmon stomachs was examined; 90 contained food.

During the lake survey we noted that significant proportions of the pinks caught by gillnetting and trolling contained food (about 20% of the males and 50% of the females). We examined the stomach contents of gillnet-caught pinks from Pancake Bay, near the Pancake River, where we also took samples from the spawning run. These stream samples were combined with some from the Carp River. We examined the stomach contents in a sample of 20 caught in commercial nets near Burnt Island, Lake Huron (date unknown). Table 7 lists the taxa which were represented to a greater or lesser degree among the stomach contents.

Figure 9 shows the proportions of the catches, from different periods, that contained food items, and the average volume of contents per individual containing food. About 1/3 of pinks caught in the open waters during Cruise 1 (July 30 to August 13) contained food which amounted to 2.8 mL on average. The items most frequently observed were aquatic crustacea, fish and terrestrial insects (Table 8).

During the second cruise (August 17-26) the average volume of contents increased to 4.0 mL but a smaller proportion of the catch contained food (27%). The composition of the contents remained about the same as during the earlier period (Table 8).

Among pinks caught in Pancake Bay from August 23 to September 3, the average volume of food per individual rose to 5 mL, but the proportion of the catch containing food dropped to 10%. The diet consisted almost entirely of fish. Among pinks taken from the spawning runs to Pancake and Carp Rivers (August 26 to September 3), the proportion of individuals containing food was 10%, while the average volume was 5 mL. The contents were entirely fish remains. However during the late part of the spawning run (September 3 to October 3), all stomachs examined were empty.

These observations suggest that, during early and middle August, while they still occupy the open lake waters, pinks feed on a wide variety of organisms, but mainly aquatic crustacea (mysids), fish (smelts) and terrestrial insects (presumably taken from the surface). Late in August and during September, as they mature and congregate near the spawning rivers, they feed mainly on smelts.

Table 7. Taxa from which individuals were identified in stomach contents of pink salmon caught in 1981 by either gillnetting or trolling in Lake Superior and Lake Huron, or from spawning streams tributary to Lake Superior.

Aquatic crustacea	Fish	Terrestrial insects	Semi- and aquatic insects	Immature aquatic insects
Mysidacea*	Osmeridae	Psocoptera*	Hemiptera*	Diptera*
Cladocera	Cyprinidae	Hymenoptera*	Coleoptera	Tricoptera
Copepoda	Gasterosteidae	Leipidoptera*		Plecoptera
Amphipoda		Diptera*		Odonata
		Coleoptera		
		Hemiptera		
		Homoptera*		
		Tricoptera*		
		Plecoptera		
		Odonata		

*Identifies those groups which were observed most often within each category.

Table 8. Frequencies of occurrence of diet items in stomachs of pink salmon from various locations.

	Lake Superior 8/17-28	Lake Superior 7/30-8/13	Pancake Bay 8/23-9/4	Pancake + Carp R. 8/26-9/3	Lake Huron Burnt I.	Totals
Aquatic crustacea	33	7	0	0	0	40
Fish	23	3	9	7	10	52
Terrestrial insects	33	6	2	0	1	42
Aquatic adult insects	6	0	0	0	0	6
Insect immature (aquatic)	6	2	0	0	0	8
Totals	101	18	11	7	11	148

EATING QUALITY OF SPORT-CAUGHT PINKS

Fifty-five of 100 evaluation sheets distributed were returned. Most respondents had either fried or baked the salmon, while fewer boiled or broiled it. Their assessment of its quality was as follows:

	VG	G	F	P
Freshness	58%	38%	4%	0%
Appearance	65	33	2	0
Texture	56	35	7	2
Taste	58	42	0	0
Ease of preparation	62	38	0	0

It is clear that Lake Superior pink salmon taken at stream mouths and from spawning streams (where these fish had been caught) can provide a desirable meal. Several respondents compared the flavour favourably to that of lake and speckled trout. The flavour was reported to be mild and to be enhanced by seasonings, onions, lemon and butter.

SEX RATIO AND SIZE OF GILLNET-CAUGHT CHINOOKS AND COHO

Eighty-four chinooks were taken in gillnets, usually in small individual catches over a wide area (Appendix Table 1). The sex and state of maturity were recorded for 75. Of these 4 were maturing and 71 were immature. Among the immatures, 40 were males and 31 were females, a non-significant deviation from 50:50 ($p>0.10$). The length and weight distributions of the immature chinooks are shown in Figures 5 and 6. Average fork length of immature males was 38.6 cm (15.2 in) and of females 39.3 cm (15.5 in). The difference was not significant ($p=0.69$). On average, males weighed 0.69 kg (1.5 lb) and females 0.80 kg (1.8 lb), again a non-significant difference ($p=0.31$). The maturing chinooks were considerably longer and heavier:

♂	50.9 cm	1.6 kg	(set no. 21)
♀	51.0	1.7	(set no. 21)
♂	40.0	1.0	(set no. 29)
♀	63.0	3.0	(set no. 52)

Fifty-two coho were caught in gillnets over a wide area. Of 51 whose sex and state of maturity were noted, 48 were maturing and 3 were immature. Among the maturing fish, 18 were males and 30 were females, a non-significant deviation from 50:50 ($p>0.10$). Their length and weight distributions are shown in Figures 7 and 8. Males averaged 46.3 cm (18.2 in) in fork length and females 46.7 cm (18.4 in). On average males weighed 1.2 kg (2.6 lb) and females 1.1 kg (2.4 lb). The differences between sexes in length

and weight were non-significant ($p=0.66$, $p=0.63$). One immature male weighed 0.9 kg (2.0 lb) and 2 immature females weighed 0.8 kg (1.8 lb) and 1.2 kg (2.6 lb).

SUMMARY AND DISCUSSION

A survey to assess the commercial and sport fishing potential of pink salmon in Lake Superior was carried out from July 29 to August 28, 1981. Fishing by gillnetting and trolling, from Gros Cap to Santoy Bay, involved setting 80,600 m of gillnet and trolling for 27.5 hours with sport fishing tackle.

The gillnet catch was 48%, by number, of coregonines (lake herring, lake whitefish, round whitefish, chub and tulibee) and 36% salmonines (pink salmon, lake trout, chinook salmon, coho salmon, rainbow and brown trout). Of the total catch of 658 salmonines, Pacific salmon formed 61% (402) and lake trout 36% (247). Largest catches of lake trout were made in bottom sets. No salmon were caught in bottom sets. All salmon were caught in nets set either at the surface or in "canned" sets down to 4 fath (7.3 m). Lake trout were caught rather rarely at these depths.

Overall the catch per unit of effort of pink salmon was 3.3 fish per 1000 m of gillnet set. Catches improved during the latter of two cruises (August 17 to 28) to 6.6 pinks per 1000 m. In sites near spawning streams (Michipicoten, Old Woman and Agawa Rivers) and on the north side of Michipicoten Island, during the second cruise, catches of pinks in near-surface sets yielded 10-20 pinks per 1000 m. Although the catching ability of different gillnet-mesh sizes and twines was not tested rigorously, greatest catches per 1000 m were made in 3-1/8 in (7.9 cm) monofilament and 3-1/4 in (8.25 cm) multifilament web.

Trolling was carried out usually in the afternoon and evening, as time permitted. Using 2 rods and a modified version of West Coast pink salmon trolling lures, 57 salmonines were caught during 27.5 hr of fishing (2.1 fish per hr). Of the total catch 46% (22) were pinks, 35% (20) were lake trout, and 16% (9) were chinooks. Catches were better late in the survey (August 20-26) and close to spawning streams like the Michipicoten and Old Woman Rivers.

All pinks caught were maturing, i.e., they would have spawned in 1981. The sex ratios among pinks caught both by gillnetting and by trolling deviated significantly from 50:50, males predominating. The average weight of gillnet-caught pinks was 0.59 kg (1.3 lb); males weighed slightly more than females. Trolled pinks weighed 0.52 kg (1.1 lb) on average, significantly less than gillnet-caught fish. Males were heavier and longer than females for a given trunk length, reflecting their relatively greater change in body shape as they matured. Pinks continued to grown as the survey progressed.

During early and middle August, while pinks still occupied open lake

waters, they fed on a variety of organisms, but mainly on mysids, smelts and terrestrial insects. Late in August and during September, as they matured and congregated near spawning rivers, they fed mainly on smelts.

In total, 84 chinooks and 52 coho were caught in gillnets. The chinooks were mostly immature fish about 39 cm (15.3 in) long, weighing 0.75 kg (1.6 lb). The coho were mostly maturing fish about 46 cm (18.3in) long, weighing 1.1 kg (2.4 lb). Both species were caught over a wide part of the survey area.

We conclude that, using gillnets, a limited fishery for pink salmon may be warranted after they have congregated inshore near spawning streams. Our catches in the latter half of August suggest that at least 4 areas should be tested further at that time of year, using a directed fishery to determine the best fishing sites among them. These areas are the north side of Michipicoten Island, Michipicoten Bay, Grindstone and Ryan points, and Agawa Bay. Perhaps Santoy Bay should be tested in late August as well. Fishing in near-surface depths with mesh sizes of about 3 in (7.6 cm) appears to optimize catching of pink (and other) salmon while minimizing the incidental catch of other species.

Our catches by trolling with flasher and hoochie lure suggest that this method provides an opportunity for sport fishermen to take pinks while they are in prime condition, i.e., before they have entered spawning streams. Their modest size and readiness to take a lure suggest that they should provide excellent sport for children. The method doesn't exclude the possibility of catching other salmon and lake trout, and it probably could be improved by experimenting with other lures and techniques, which our limited assessment didn't allow.

The survey of consumer reaction to pink salmon for home cooking shows that they would be desirable both as a commercial product and as a by-product of fishing for recreation. We noted, however, that some individuals among all salmon caught in gillnets showed more softening of the flesh than did other species such as lake trout and whitefish. Undoubtedly the higher temperatures of near-surface waters, where salmon were caught, hastened deterioration of the flesh while they were still in the nets (all fish were dressed and iced immediately they came on board). Whether or not it is necessary to soak the nets for 12 h, as was often the case during the lake survey, should be investigated. It may be that the nets fish only during the hours of greatest darkness and that a shorter overnight soak would yield just as many fish while minimizing flesh deterioration.

We are also of the opinion that the rather small gillnet catches of pinks obtained in the survey do not reflect their real abundance. Water clarity in the areas surveyed is such that gillnets set near the surface must be readily visible to fish even during the hours of greatest darkness. If the nets' visibility could somehow be reduced, it is likely that catches could be increased substantially.

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We are especially indebted to Mr. Jim McDonald, President of Ferroclad Fisheries, who placed his considerable fishing skill and equipment at the service of the project, and who skippered the LAST TIME with such finesse. Mr. Harvey Brisseau, fisherman, helped in sampling and other project work, in addition to his regular fishing duties.

Mr. Peter Ward-Whate, Fishing Services Branch (DFO), assembled much of the equipment, rigged the trolling boat, and took an active part in the lake survey. Technical supervision of the lake and spawning stream surveys was provided by Mr. Lynn Golden (OMNR), whose long experience in fisheries and research were particularly useful. He was assisted by Mr. Cam Prince, who was seconded from other duties in the Ontario Region (DFO).

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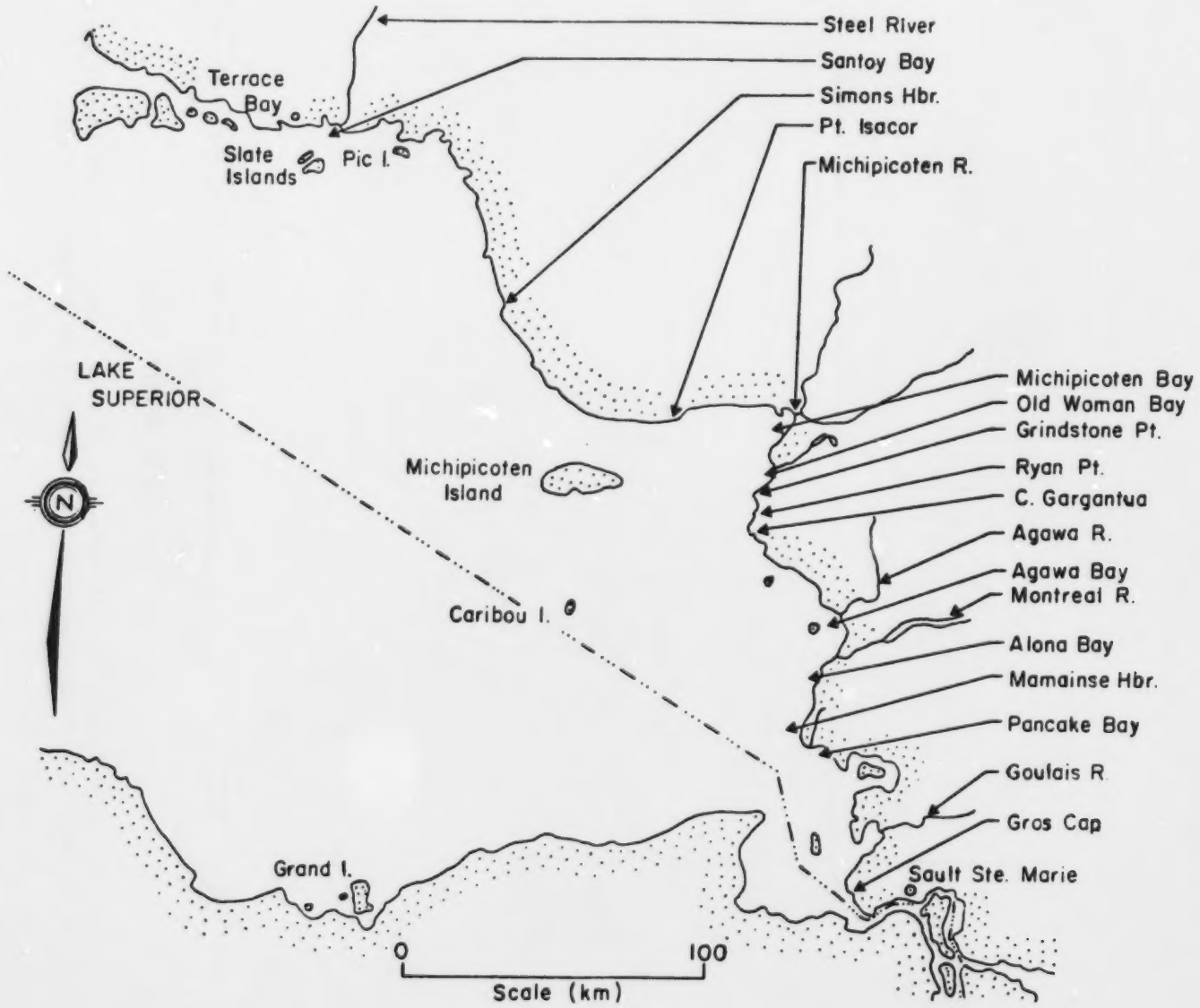

Fig. 1. Map of eastern Lake Superior showing some of the localities referred to in this report.

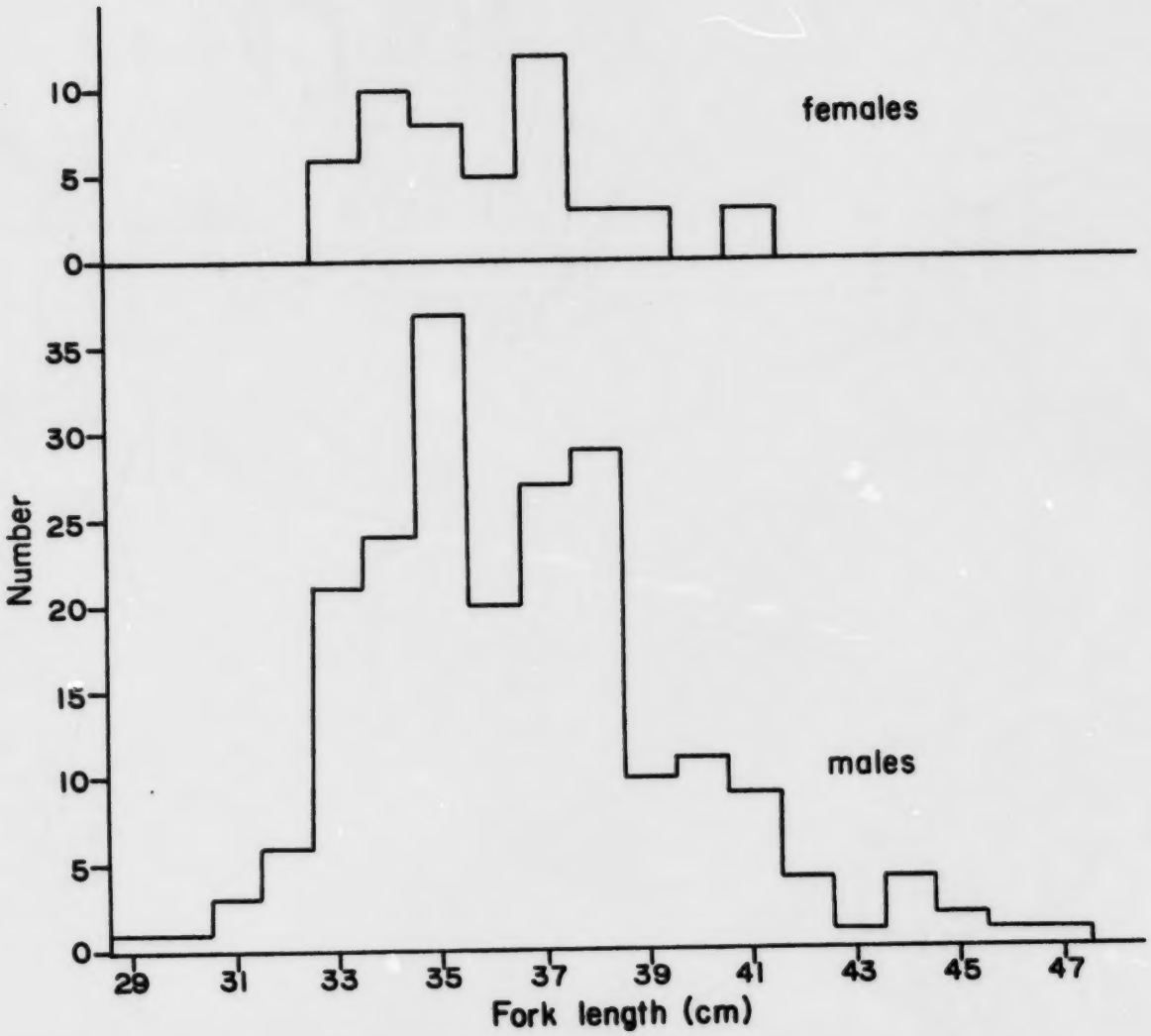

Fig. 2. Fork lengths of 212 male and 50 female maturing pink salmon caught in gillnets in eastern Lake Superior, July 29 to August 28, 1981.

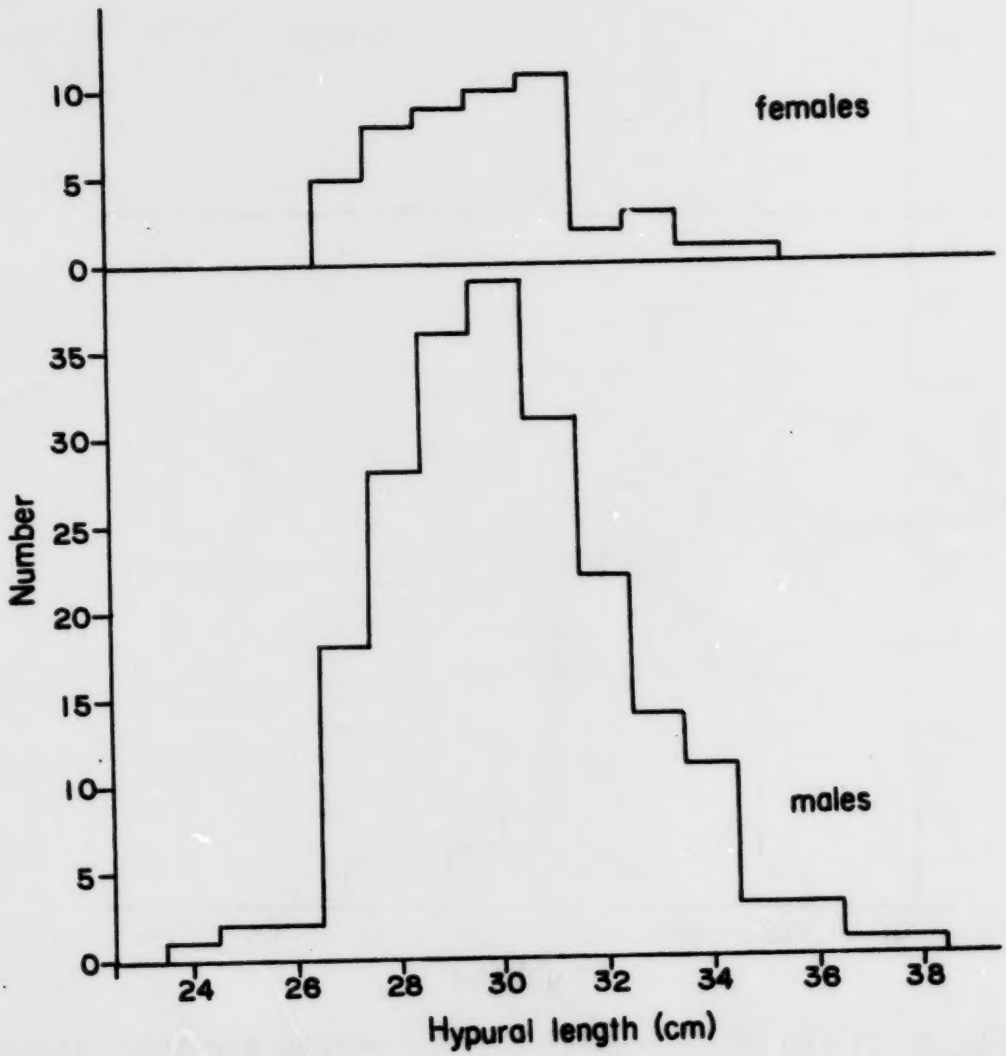

Fig. 3. Hypural lengths of 212 male and 50 female maturing pink salmon caught in gillnets in eastern Lake Superior, July 29 to August 28, 1981.

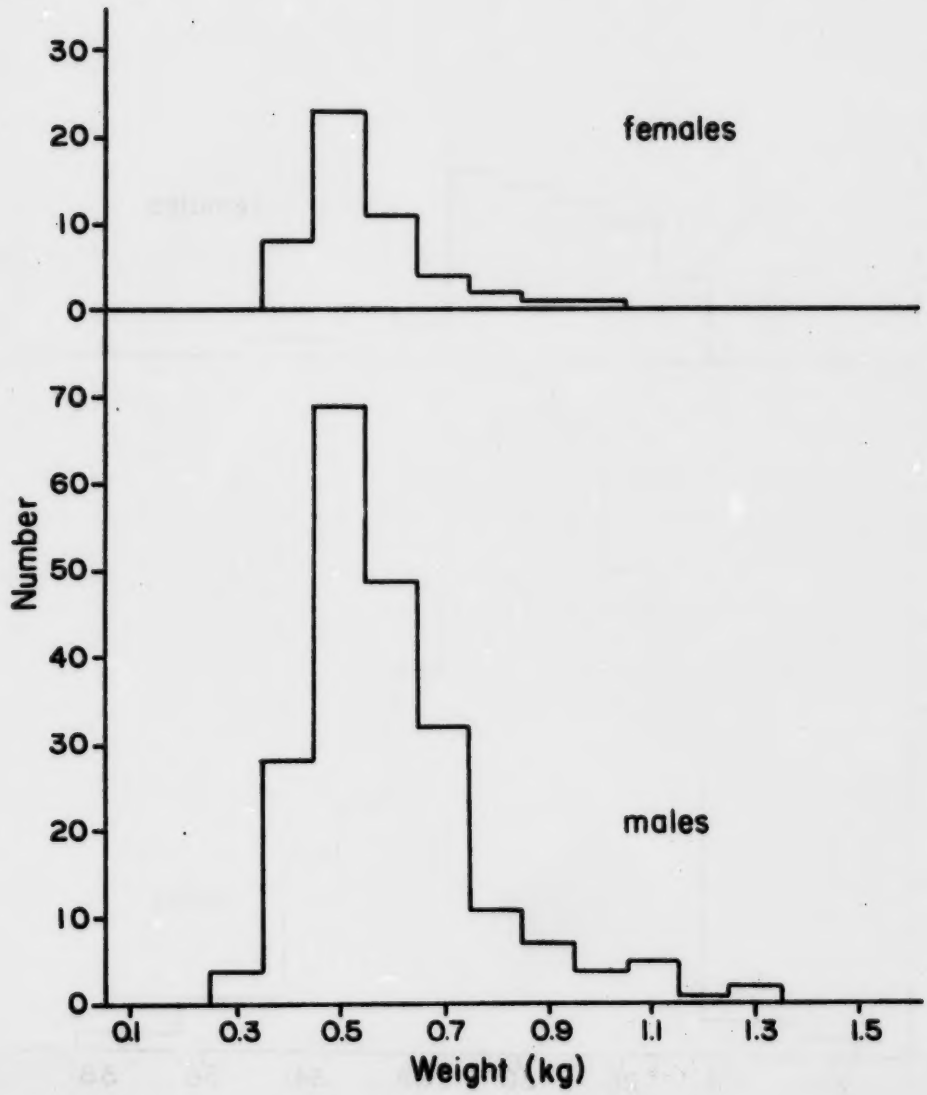

Fig. 4. Weights of 212 male and 50 female maturing pink salmon caught in gillnets in eastern Lake Superior, July 29 to August 28, 1981.

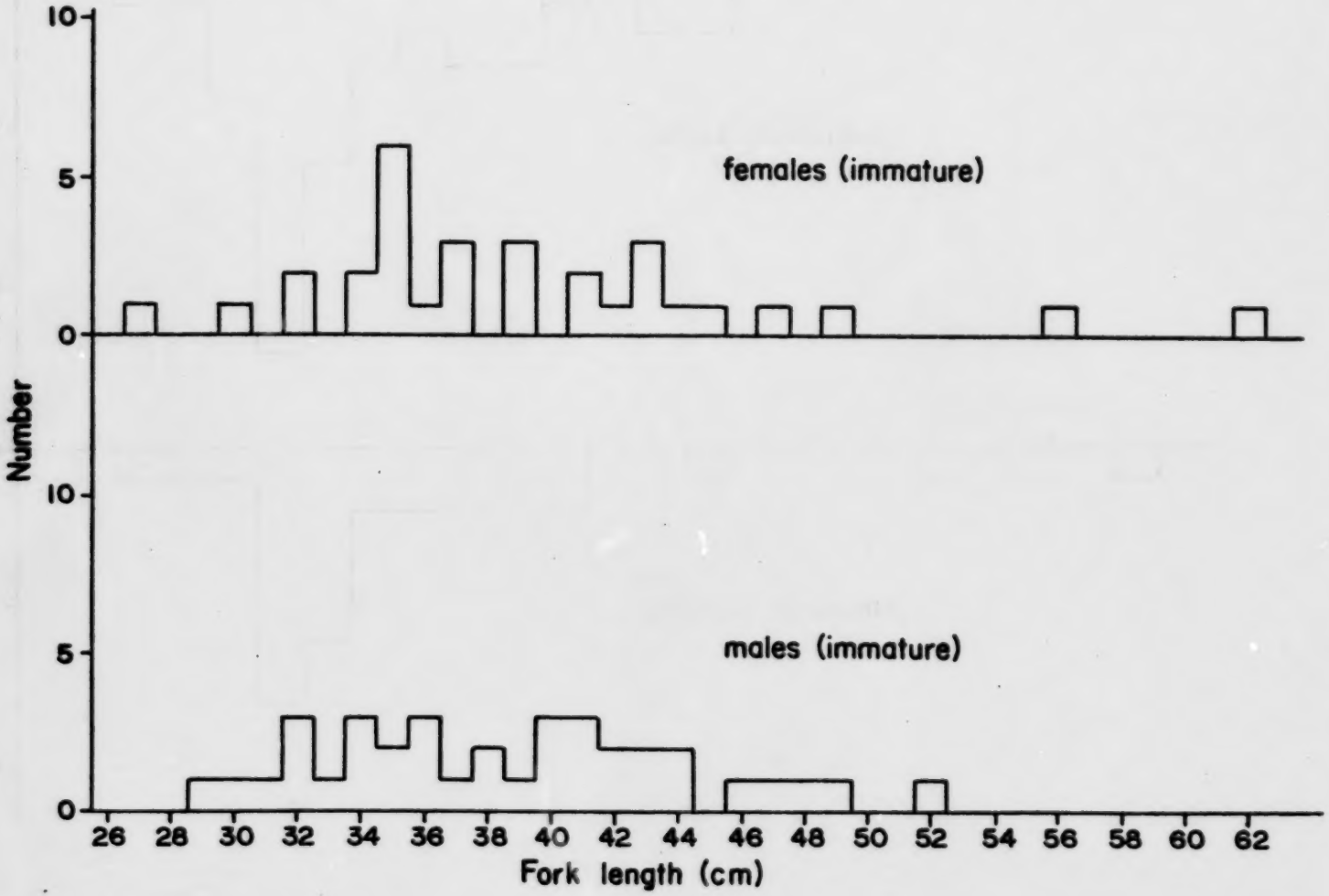

Fig. 5. Fork lengths of 36 male and 31 female immature chinook salmon caught in gillnets in eastern Lake Superior, July 29 to August 28, 1981.

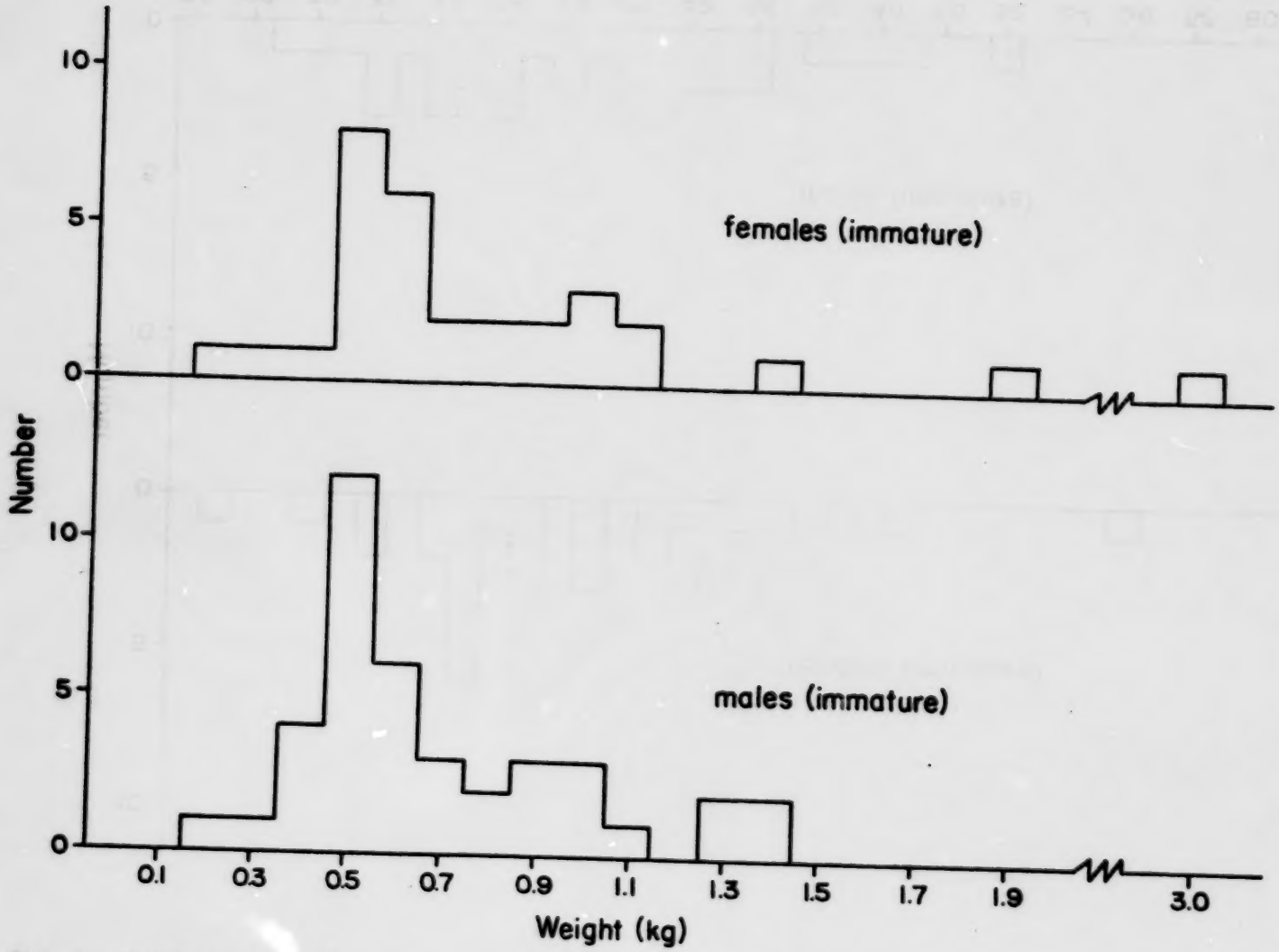

Fig. 6. Weights of 4[illegible] male and 31 female immature chinook salmon caught in gillnets in eastern Lake Superior, July 29 to August 28, 1981.

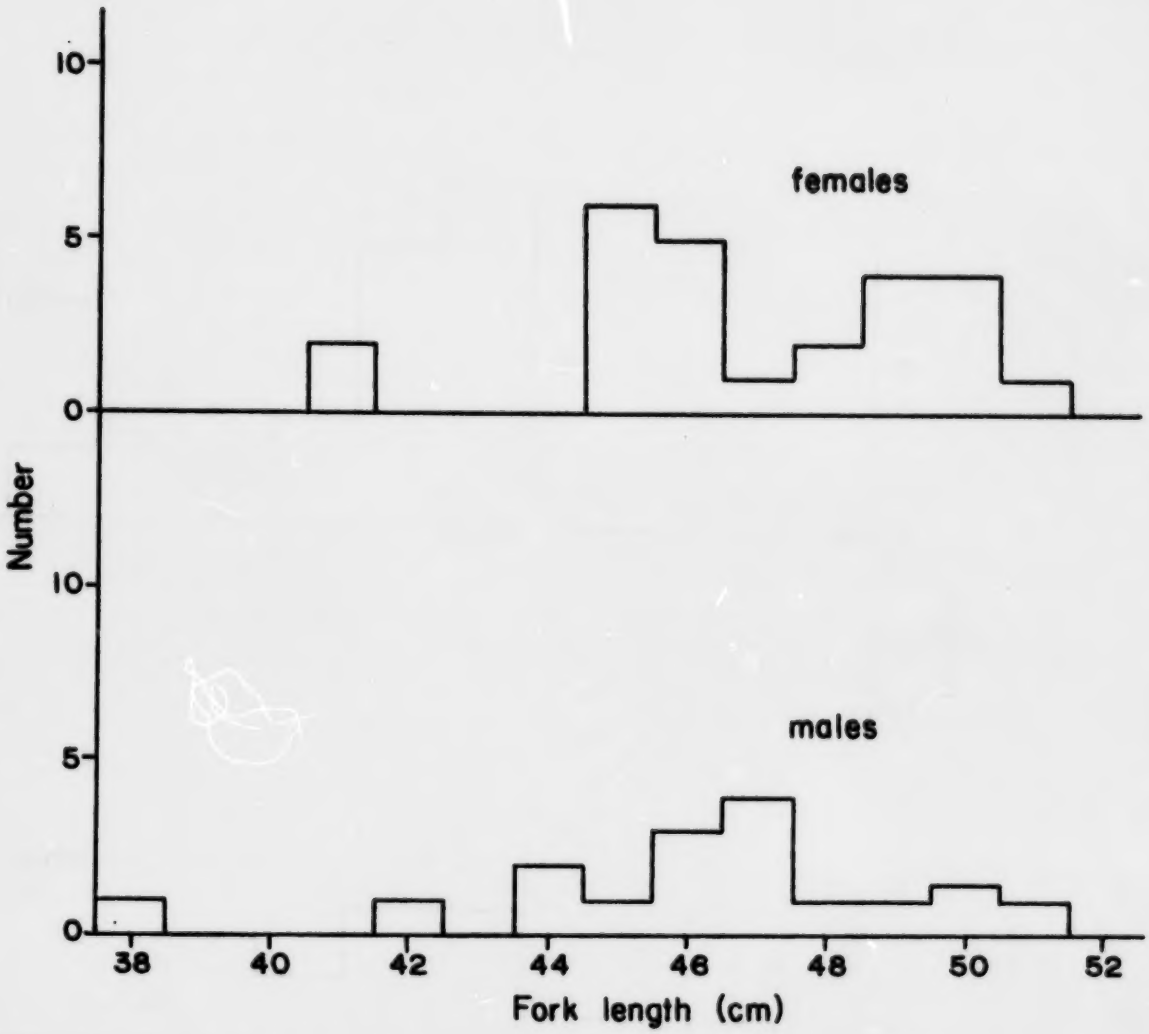

Fig. 7. Fork lengths of 17 male and 25 female maturing coho salmon caught in gillnets in eastern Lake Superior, July 29 to August 28, 1981.

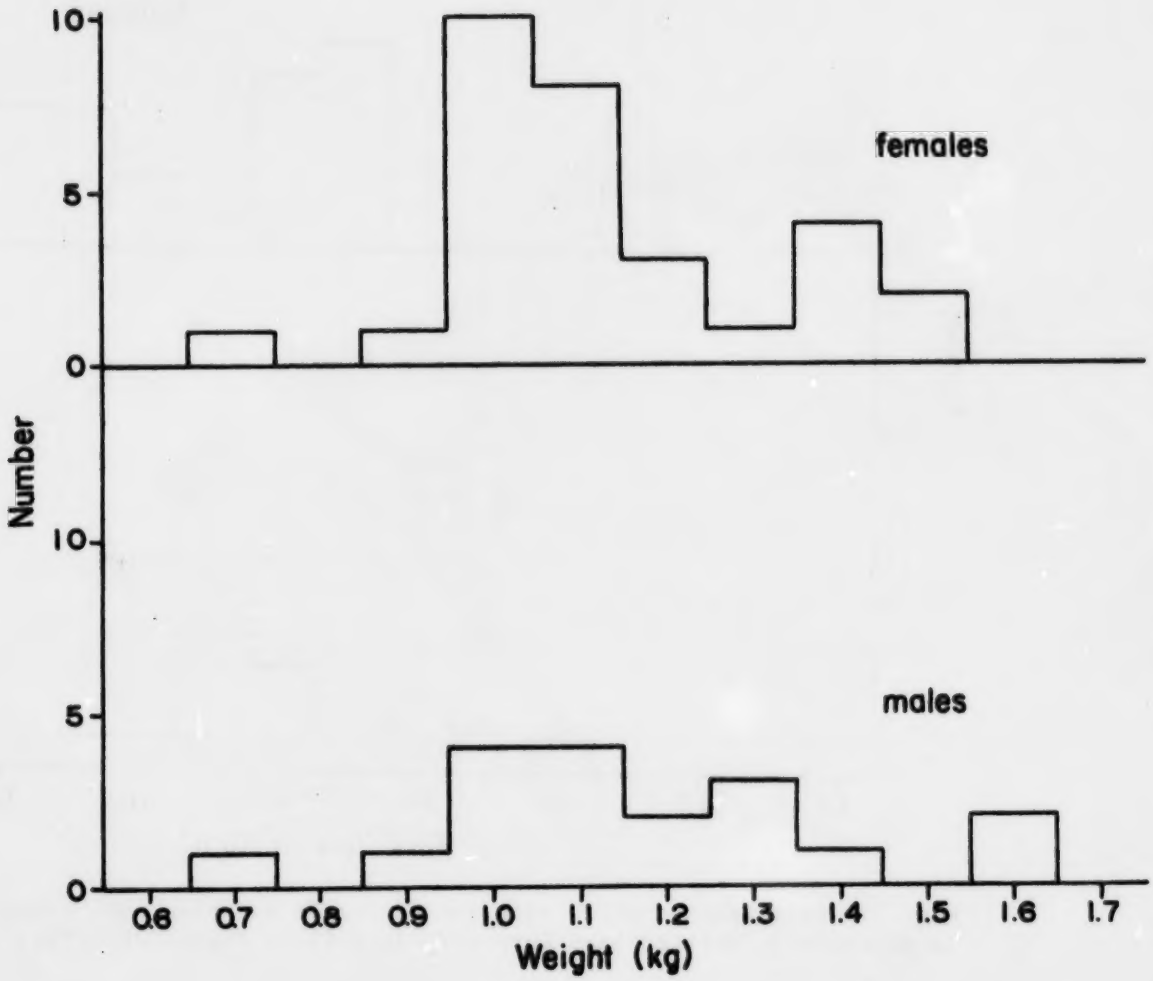

Fig. 8. Weights of 18 male and 30 female maturing coho salmon caught in gillnets in eastern Lake Superior, July 29 to August 28, 1981.

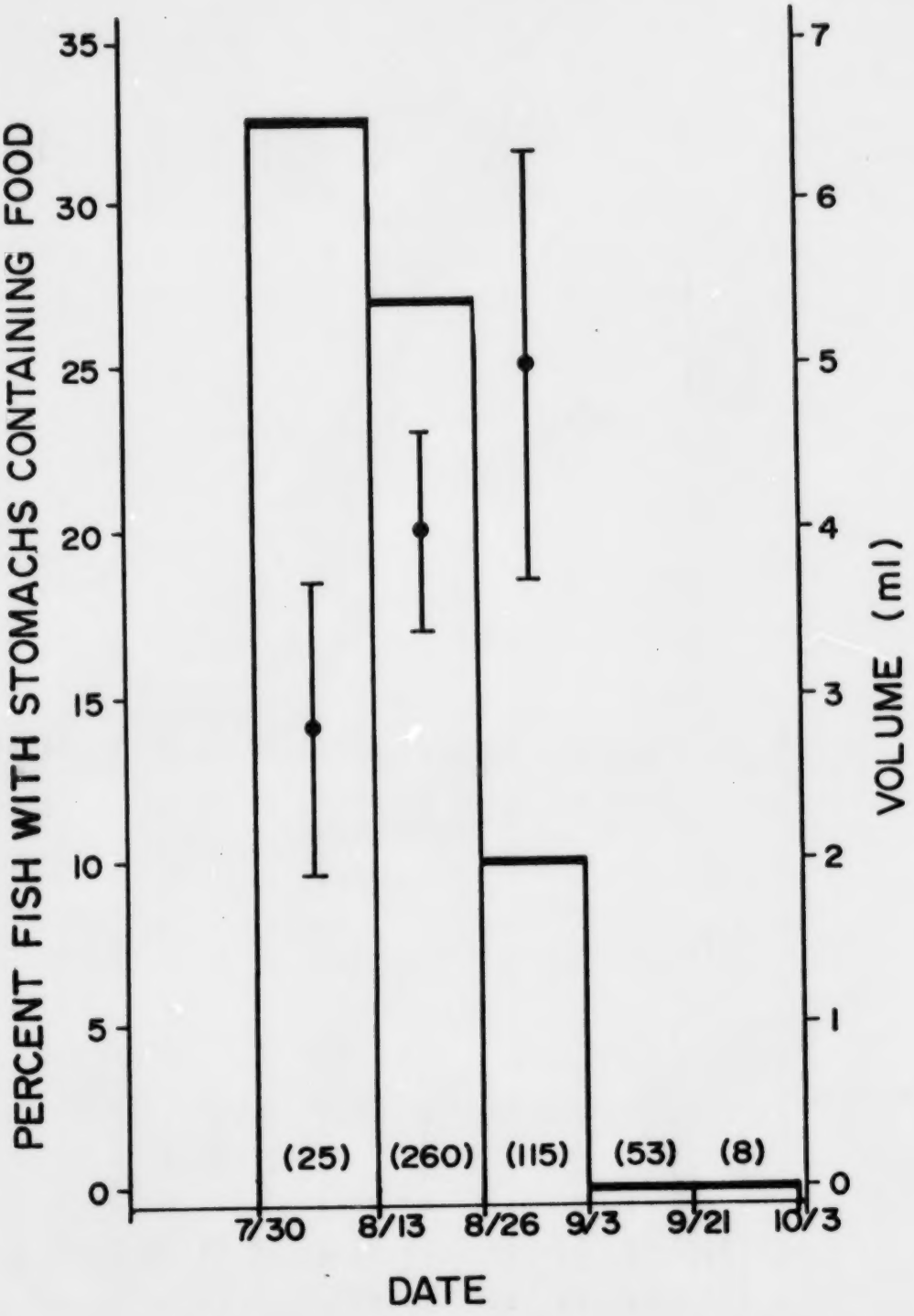

Fig. 9. Percentages of pink salmon containing food items, and average volumes of stomach contents among individuals containing food, for different time periods, 1981.

Appendix Table 1. Dates, times, locations, water temperatures (see Methods), net depths and lengths, and catches by species for 78 gillnet sets in eastern Lake Superior, July 29 to August 28, 1981 (*denotes net set on bottom).

Set no.	Date	Time set lifted	Location	Water temp. (C)	Water depth (fa)	Net depth (fa)	Mesh size (in)	Mesh length (m)	Pink	Coho	Chinook	Lake trout	Lake white-fish	Lake herring	Suckers	Round white-fish	Other
1	Jul 29 30	1600 0800	S. side of Pancake Sh.	14.5	4-7	0	3 1/8 3 1/2 3 3/4	500 250 250					1	1	9		
2	Jul 29 30	1705 0910	NE of Pancake Sh.	14.7	4-8	0-4	3 1/4 3 1/2 3 3/4	500 250 250					7		28		
3	Jul 30 31	1500 1030	Off Pancake Cr.	16.0	6-12	1-4	3 1/8 2 3/4 3 1/8 3 1/4	250 250 250 500		3	2		1	1			1 Rainbow Smelts
4	Jul 30 31	1345 0945	SW of Pancake Pt.	16.0	4-24	2-4	3 1/4	500		1	1	1	1				Smelts
5	Jul 30 31	1620 0745	SW of Coppermine Pt.	16.6	5-9	2-4	3 1/4	1000		4	1		4		10		
6	Jul 31 Aug 1	1245 1115	Maple I. Light	-	3.5-10	1-4	3 1/8 3 1/4	500 500			1		3	1	6		1 Perch Smelts
7	Jul 31 Aug 1	1325 1200	1 mi N of Maple I.	-	10.5-12	0	3 3/4 3 1/2	250 250		1	1	1		1	30		Smelts
8	Jul 31 Aug 1	1455 1000	Off Batchawana I.	17.0	5-8	2-4	2 3/4 3 1/4	500 500					3	1	1		Smelts
9	Jul 31 Aug 1	1530 0900	Off Corbeil Pt.	17.8	2-10	1-4	3 1/4	1000					2	2	2		Smelts
10	Aug 2 3	1005 1310	E of Agawa Bk.	-	5-38	1-4	3 1/4	1000			1	2		2			
11	Aug 2 3	1155 1220	Vroomen I.	14.4	5-24	2-4	3 1/8 3 1/4	500 500	1	1		1	1		45	2	Smelts 3 Burbot
12	Aug 2 3	1330 1045	Alona B.	15.5	7-14	1-4	3 1/8 2 3/4	500 500	1						2		

Appendix Table 1 (cont'd)

Set no.	Date	Time set	Time lifted	Location	Water temp. (C)	Water depth (fa)	Net depth (fa)	Mesh size (in)	Mesh length (m)	Pink	Coho	Chinook	Lake trout	Lake white-fish	Lake herring	Suckers	Round white-fish	Other
13	Aug	3	1830	NE of Michipicoten I.	9.8	3.5-23	1-4	3 1/4	500	3		1	1	40	6			
		4	1110					2 3/4	500									
14	Aug	3	1945	E end of East Sand B.	10.2	6-15	0-4	3 1/4	1000		1		1	18	35	3		
		4	1110															
15	Aug	3	2050															
		4	0810	E of False Hbr.	10.5	3-18	0-4	3 1/4	500		4				32			
								3 1/8	500									
16	Aug	4	1635	Off Michipicoten R. (Perkwakia Pt.)	13.8	44	0-8	3 1/4	500			1	1		4			Smelts
		5	0815					3 1/8	500									Smelts
17	Aug	4	1725	Perkwakia Pt.	14.5	5-43	0-4	3 1/4	1000			1			10			
		5	0910															
18	Aug	4	1830	Off Makawa R.	14.4	4-15	0-4	2 3/4	500		1		1		17	1		
		5	1015					3 1/4	500									
19	Aug	5	1310	Isacor Pt.	15.3	5-34	0-12	3 1/4	500		1	10	1		24			1 Tullibee
		6	0835					2 3/4	500									
								3 1/4	500									
								3 1/8	1000									
20	Aug	5	1445	Isacor Bk.	14.4	25-32	btm.	3 1/4	1000*				29		60			
		6	1000					3 3/4	250*									
								3 1/2	250*									
21	Aug	6	2000	Jackfish B.	13.3	6-25	0-4	3 1/4	2000		1	13		1	23	2		? Chub
		7	0900					3 1/8	1000									Alewives
								2 3/4	250									Smelt
22	Aug	7	1345	W. Santoy B.	13.0	5-39	0-4	3 1/4	1500	3		6	8	5	7	3		Smelts
		8	1000					3 1/8	1000									
								2 3/4	500									
23	Aug	7	1130	Santoy B.	13.3	2-15	0	3 1/4	500			1		9	3	3		1 Alewife
		9	0900															Smelts
24	Aug	7	1140	Santoy B.	-	4-18	0-1	4 1/2	1000			1	2	79				
		9	0930															

Appendix Table 1 (cont'd)

Set no.	Date	Time set	Time lifted	Location	Water temp. (C)	Water depth (fa)	Net depth (fa)	Mesh size (in)	Mesh length (m)	Pink	Coho	Chinook	Lake trout	Lake whitefish	Lake herring	Suckers	Round whitefish	Other
25	Aug 7	1150		Santoy B.	-	4 1/2-25	0-1	3 1/4	500			2	2	6	5	5		
	9	1000						2 3/4	500									
26	Aug 7	1200		Santoy B.	-	2-35	0-1	3 1/8	1000	2		1	4		3		1	
	9	1030						3 1/4	500									
27	Aug 10	1620		S of White Gravel	13.8	2-23	0-2	3 1/4	1000	1		2		6	2	47		1 Brown tr.
	11	1025																
28	Aug 10	1935		2 mi W of Swallow R.	13.5	5-12	0-1	3 1/4	500			1		1	11	7		
	11	1140																
29	Aug 10	2030		Simons Hbr.	14.0	10-24	1-2	3 1/4	500	1		3		3	1	9		1 Brown tr.
	11	0845																
30	Aug 11	1540		Crane I.	11.5	6-27	0-1	4 1/2	600	1	1	1	1	3		10		
	12	1225																
31	Aug 11	1640		1 mi E of Ganley Hbr.	11.0	-	0	3 1/4	500						49	4		
	12	1135																
32	Aug 11	1720		Pilot Hbr.	-	14-20	2	3 1/4	500		1	5	1		23	4		
	12	1050																
33	Aug 11	1755		4 mi W of Ghost R.	11.1	-	-	3 1/4	500	1	1	6			20	3		
	12																	
34	Aug 11	1820		1 mi W of Ghost R.	-	5-29	0-2	3 1/4	500	4	2	10	2	3	36	1		Smelts
	12	1010						2 3/4	500									
35	Aug 11	1900		Isacor Pt.	-	5-28	0-2	4 1/2	400	1		1	6		1	1		1 Chub
	12	0800						3 1/4	500									Smelts
36	Aug 12	1415		Bonner Hd. (Michipicoten I.)	14.8	5-32	1	3 1/4	500	3					2	2		
	13	1220						2 3/4	500									
37	Aug 12	1500		4 mi E of Bonner Hd.	15.2	3-30	0-2	3 1/8	500	1	1				6			
	13	1130						3 1/4	500									
38	Aug 12	1530		NE Michipicoten I.	15.5	3-30	0-2	3 1/4	500						2	2		
	13	1105																

Appendix Table 1 (cont'd)

Set no.	Date	Time set	Time lifted	Location	Water temp. (C)	Water depth (fa)	Net depth (fa)	Mesh size (in)	Mesh length (m)	Pink	Coho	Chinook	Lake trout	Lake white-fish	Lake herring	Suckers	Round white-fish	Other
39	Aug 12	2130		Quebec Hbr. (Michipicoten I.)	-	3-6	btm.	4 1/2	1000*				9	40	39	16		
	13		0830															
40	Aug 13	1645		Leach I. and Ella I.	16.2	-	0-2	3 1/8	500				1	1	1	1	1	
	14		0800					3 1/4	500									
41	Aug 13	1730		Telegraph Bk. (N of Beatty C.)	17.7	3-20	1	2 3/4	500							4		
	14		0730					3 1/4	500									
42	Aug 13	1830		Gargantua Hbr.	17.2	3-20	0-2	3 1/4	1000							2		
	14		0630															
43	Aug 17	0905		2 mi N of North Sandy I.	14.8	14-15		3 1/8	500					1				
	18		1020					3 1/4	500									
44	Aug 17	1010		1 mi S of Coppermine Pt.	12.5	5-8	1	2 3/4	500				6			2		Smelts
	18		0910					3 1/4	500									
45	Aug 17	1030		Coppermine Pt.	10.4	5-9	0-2	3 1/4	1000				10		1	1		Smelts
	18		0830															
46	Aug 18	1115		Goulais Pt.	16.3	3-10	0-2	3 1/4	1000	1					2	13		1 Rainbow Smelts 1 Perch 1 Burbot
47	Aug 18	1325		5 mi N of Gros Cap	17.1	6-25	2-3	3 1/8	500	1					1			Smelt
	19		1000					3 1/4	500									
48	Aug 18	1410		Btn Jackson I. and Gros Cap	17.5	-	-	2 3/4	500			1				1		1 Rainbow 1 Smelts
	19		0910					3 1/4	500									
49	Aug 19	1450		3 mi SW of Theano Pt.	15.0	16-19	2-3	3 1/8	500	1			1					
	20		1040					3 1/4	500									
50.	Aug 19	1540		Alona B.	12.9	8-13	1	2 3/4	500				2					Smelts
	20		0940					3 1/4	500									
51	Aug 19	1555		Alona B.	12.9	7-11	0-2	3 1/4	1000							2		
	20		0910															

Appendix Table 1 (cont'd)

Set no.	Date	Time set	Time lifted	Location	Water temp. (C)	Water depth (fa)	Net depth (fa)	Mesh size (in)	Mesh length (m)	Pink	Coho	Chinook	Lake trout	Lake white-fish	Lake herring	Suckers	Round white-fish	Other
52	Aug 20		1730	Michipicoten B.	17.5	16-18	0-18	3 1/4	500*				81					
	21		0750					3 1/8	500*			1	20					1 Sturgeon
								3 1/4	1000	14		2				2		
								2 3/4	300*				37			1		
53	Aug 21		1645	Grindstone Pt.	15.9	4-27	0-3	2 3/4	800	1						6		
	22		0945					3 1/4	2000	19						3	16	1 Burbot
54	Aug 21		1855	Old Woman B.	14.4	4-19	1-2	3 1/8	500	1	1	1				8		1 Rainbow
	22		0855															
55	Aug 22		1300	McKinnon Bk.	16.5	23	1-23	3 1/4	500	2						1		
	23		1055					2 3/4	500	3			1					
								2 3/4	300*				1			1	1	1 Burbot
								4 1/2	500*				4			11	1	
56	Aug 22		1400	1 mi NE of	17.0	6-30	0-2	3 1/8	500	7								
	23		1015	Ryan Pt.				3 1/4	500	1		1					1	1 Rainbow
57	Aug 22		1500	Grindstone Pt.	16.4	5-17	0-2	3 1/4	1000	32			1			2	1	1 Rainbow
	23		0835					2 3/4	500	2								
58	Aug 23		1500	5 mi W of	14.9	3-20	0-1	3 1/4	500	4					1	7		
	24		1240	East End Lt.				2 3/4	500	2								
59	Aug 23		1600	Bonner Hd.	14.9	5-25	0-1	2 3/4	500	4								
	24		1150					3 1/4	500	7								
60	Aug 23		1645	5 mi W of	14.8	5-13	0	3 1/8	500	25	4							
	24		1100	Bonner Hd.														
61	Aug 23		1740	W end of	10.9	8-9	1-2	3 1/4	500		5				2			
	24		1005	Michipicoten I.														
62	Aug 23		1835	W side of	12.2	3-25	0	3 1/4	500		4				34	15		
	24		0850	Quebec Hbr.														
63	Aug 24		1515	Isacor Pt.	16.4	8-22	0	3 1/4	500	6	1				3			
	25		1030															
64	Aug 24		1530	1 mi W of	-	2-6	1	3 1/8	800	12	2				12			
	25		1015	Isacor Pt.														

Appendix Table 1 (cont'd)

Set no.	Date	Time set	Time lifted	Location	Water temp. (C)	Water depth (fa)	Net depth (fa)	Mesh size (in)	Mesh length (m)	Pink	Coho	Chinook	Lake trout	Lake white-fish	Lake herring	Suckers	Round white-fish	Other
65	Aug 24		1600	3 mi W of	-	7-18	0.5	2 3/4	500	6		2			6			
	25		0930	Isacor Pt.				3 1/4	500									
66	Aug 24		1640	7 mi W of	17.0	6.45	0	3 1/4	500	1			1		5			
	25		0850	Isacor Pt.				2 3/4	500				1		2			
67	Aug 24		1710	3 mi E of Pilot	16.8	8-25	1	3 1/4	500						2			
	23		0815	Hbr.														
68	Aug 25		1445	Grindstone Pt.	18.2	8-21	0-1	3 1/4	500	5							1	
	26		1000					2 3/4	500									1 Chub
69	Aug 25		1530	Grindstone Pt.	18.2	5-8	0-1	2 3/4	500	8							1	
	26		0930					3 1/4	1000	8			2					
70	Aug 25		1600	Grindstone Pt.	18.1	5-20	0	3 1/8	800	6							1	
	26		0900					3 1/4	500	5								1 Rainbow
71	Aug 26		1500	E shore of	15.0	2.5-5	0-1	3 1/4	500		1							
	27		1015	Caribou I.				2 3/4	500									
72	Aug 26		1540	N end of Caribou	16.2	2-8	0	2 3/4	300		3		2		1		11	1 Burbot
	27		0930	I.				3 1/8	800	9	2							
73	Aug 26		1630	SW shore of	15.3	2-7	0-1	2 3/4	500				2		2			2 Burbot
	27		0835	Caribou I.				3 1/4	500	1					3			
74	Aug 26		1710	Caribou I. Lt.	15.4	3-7	1	3 1/4	500						4			
	27		0810															
75	Aug 26		1755	SE Corner of	15.4	2-7	0-1	3 1/4	500	1	3							
	27		1045	Caribou I.														
76	Aug 27		1600	Agawa R.	18.5	3-17	0-1	2 3/4	500			2						2 Pickerel
	28		0905					3 1/4	500	15		2				1		
77	Aug 27		1620	Agawa R.	18.5	2-6	0	3 1/4	500	10						2		
	28		0845															
78	Aug 27		1630	Agawa R.	18.5	2-6	0	3 1/4	1000	23						7		
	28		0820															